

STRUCTURING SPONTANEITY: A PARADOX IN LEARNING?

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Meaningful learning can seem effortless in spontaneous explorations. But is it possible to evoke the same wonder and curiosity in structured spaces? Is it possible to bridge the two? How do we structure learning sessions to help students arrive at scientific concepts spontaneously?

“Learning is the human activity that least needs manipulation by others. Most learning is not the result of instruction. It is rather the result of unhampered participation in a meaningful activity.”

— Ivan Illich.

Much meaningful learning occurs through spontaneous, effortless immersion in one’s natural surroundings, or through real-life experiences with gardening, taking care of animals, or growing food. Such explorations can nurture deep curiosity and evoke a sense of wonder. But is it possible to create such learning spaces for 12–13-year-olds in a structured space? How much structure would such spaces need, particularly if scientific concepts and skills are to be learnt? Will this structure take away from the sense of wonder that comes with spontaneity and serendipitous findings? These were some questions I grappled with while designing a learning session, for a group of middle-school students, aimed at encouraging an exploration of the diversity of life in their immediate surroundings.

Designing the learning sessions

My students lived in peri-urban areas and studied in local government schools. As these were the early days of the COVID-19 lockdown, the school premises and its natural surroundings were inaccessible. While some of the students had access to open spaces around their homes, others had a small garden, or grew flowers and vegetables on their terrace. My engagement with them was structured around six online sessions of one hour duration each, on alternate days. These sessions had two objectives – (i) to encourage students to use their senses of sight, smell, hearing, and touch to learn about their surroundings, and (ii) to explore the importance of observing with attention to develop awareness of, and therefore, sensitivity to changes occurring in their surroundings. On the days we did not meet, the students were encouraged to explore their immediate surroundings – within their houses and just outside. To

keep the exploration open-ended and allow for discovery of the unexpected, the instructions for these days were kept to a minimum.

An introductory session was followed by three sessions that focused on an exploration of the outdoors – observing plants, birds, insects, and any other life in the garden, on leaves, in pots, etc. The last two sessions were focused on observing the diversity of life indoors – like spotting spiders, bag worms, ants, cockroaches, and lizards. Students were encouraged to record their observations – either by tabulating what they saw, heard (e.g., bird/ animal/ insect sounds), smelt or touched; drawing/sketching them; and/or keeping a journal that made note of the date and time at which each observation was made. The one non-negotiable instruction was to avoid taking photos. This element of structure was introduced to help students focus on observing with all their senses.

Observing the living world around us

The students had many questions at the end of our first session: "What if we are not able to identify the plants, birds, or insects? How many birds or plants do we have to see? How do we describe bird sounds? What if I do not see any birds or insects? Do I have to get up early in the morning to see birds?" Most of their concerns were related to what they should write and how much detail they were expected to provide. Some expressed the worry that their drawing skills "were really bad". Others wondered how they would observe creatures that they were scared of, e.g., some insects and spiders. My response: "let's give it a chance, observe what you can, and let's see what happens. We can share our experiences in the next session, and try and resolve your concerns."

During the second online session, the students shared their first set of observations – tabulated written observations (see Fig. 1) as well as colourful sketches of birds, flowering

plants, leaves, insects, leaf shape, colour and venation, leaf margins, and the arrangement of leaves on the stems of plants (see Fig. 2). Some students had written short essays on their observations. A few others had used their sense of touch to record the textures of leaves, barks of trees, and the body surfaces of beetles. At the end of this session a specific instruction was given – to revisit each location at least three times a day (morning, afternoon and evening), and take at least 15 minutes during each visit to observe and record their findings. This 'structure' (multiple observations at different times) was introduced to help students learn how to make detailed observations, as well as look for patterns and rhythms in a focused and systematic manner.

By the third and fourth sessions, there was a shift in the way some of the students shared their experiences, from one-off and direct observations to questions and comments: "I did not realise there were so many different kinds of butterflies. They sit still for so long on not just flowers but also on leaves. What do they get from leaves? Why do birds sit on wires? Why do we see birds mostly in the mornings and evenings? What happens to them in the afternoon? Do they have an internal clock? Why do birds visit only certain trees? Insects are so good at camouflaging themselves. I did not realise that there could be so many different kinds of insects, particularly ants, in a small patch of ground. Why are there different coloured leaves on the same plant? Only after these few days I realised that there are lots of noises at night – are they made by insects or owls? I feel so bad that I have been ignoring all this nature that exists in my garden. If there is so much happening in

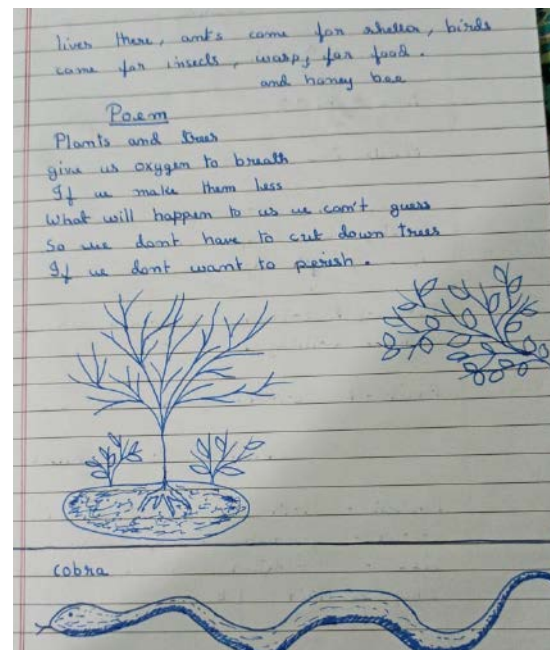
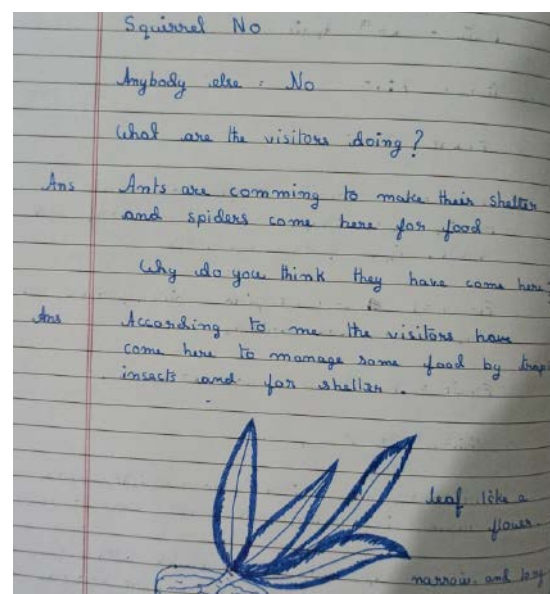
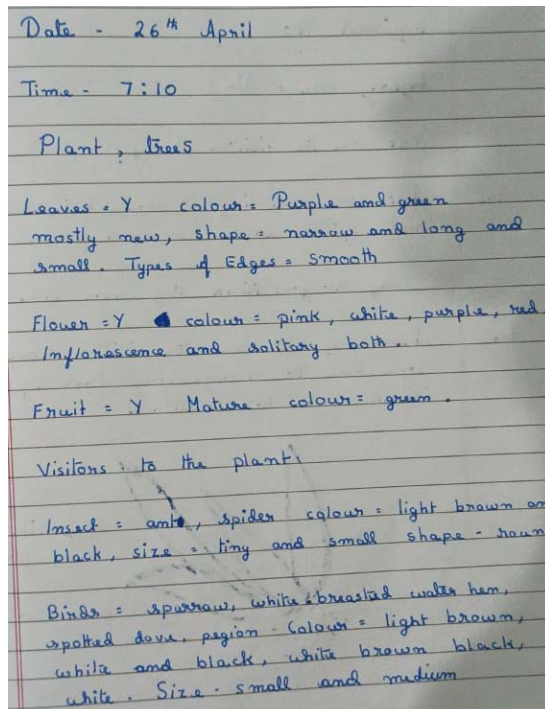


Fig. 1. Written observations, sketches, and a poem on plants by a student. Credits: Radha Gopalan. License CC-BY-NC.

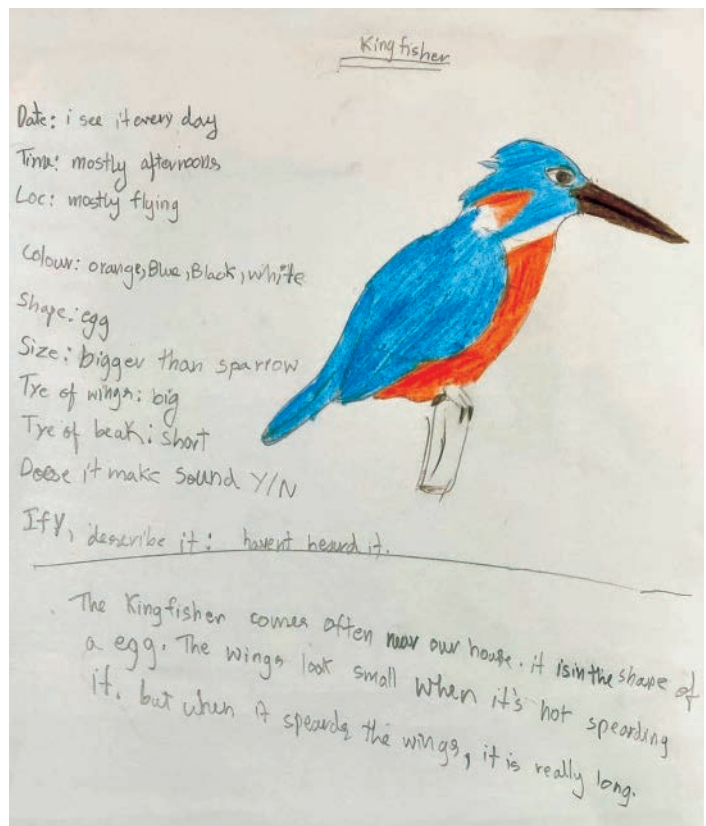
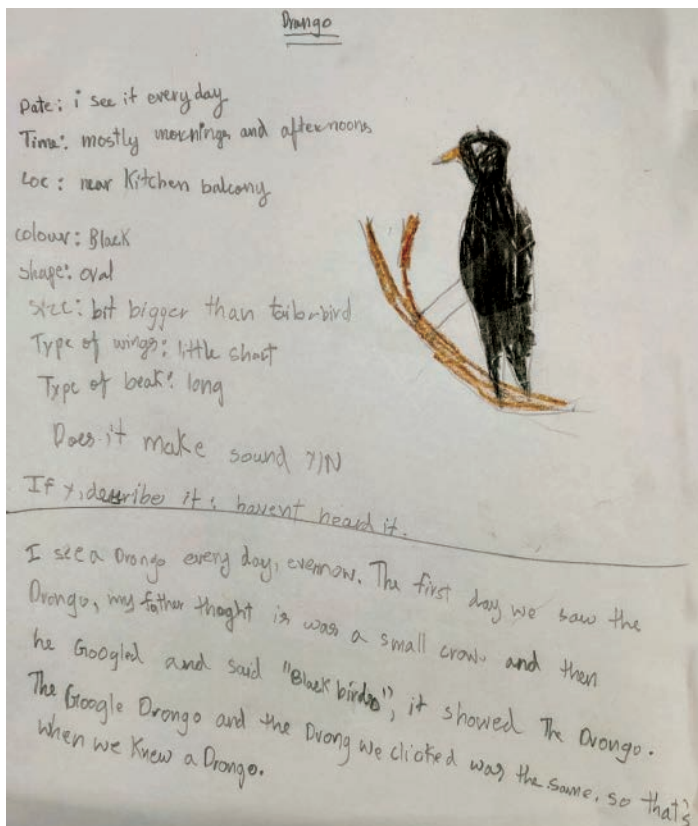


Fig. 2. Colourful sketches and descriptions of birds observed by a student.

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this small garden imagine what it must be like in a forest or in the sea! Is what we did over the last few days a part of Biology? Why can't we learn Biology in school by watching trees, birds, insects, and worms? Why is it important to use our senses and observe life around us?"

As we tried to understand and discuss these questions as a group, one of the students suddenly burst into a bird call that he had been trying to master so that he could share it with us. It was a pretty good imitation of a bulbul.

The last two sessions brought the explorations indoors – again, students were encouraged to visit the same location multiple times. This led to a new set of questions and comments: *"should we let insects live in our homes? How do spiders weave webs? Why do some spiders weave webs and others just jump around? We shouldn't really clear the cobwebs in our house, right? Lizards are actually quite useful; they can keep your house clear of ants.*

How do ants communicate with each other when one ant sees food? They are so disciplined! Why are there no lizards in my house?"

These questions led to a discussion about spiders, particularly the composition of web silk and its use in protecting eggs, capturing insects, and as a hunting tool. The sessions concluded with reflections about co-existence. Students remarked upon the fact that life was everywhere, inside and outside their homes – they only had to be attentive to sense it around them.

From questions to concepts

The questions raised by the students informed the various concepts and phenomena that were discussed during each of the online sessions. For example, questions related to the relationships between plants, insects, and birds in an ecosystem led to a discussion on food

webs as well as of the phenomenon of camouflage and its role in predator-prey relationships. Questions related to pollination led to a discussion on its role in producing a large number of the foods that we eat, including several fruits, vegetables, and nuts. Questions on patterns and rhythms of biological events, such as fruiting and flowering of trees, led to an introductory discussion on phenology, the difference between bird calls and bird sounds, and between the appearance of males and females in many bird species. Using this approach, rather than pre-planning or structuring these discussions, allowed us to collectively weave together various related concepts.

Is structuring spontaneity really a paradox?

Often, learning sessions are structured around specific topics, like plants, insects, microorganisms, food chains and

food webs etc. Once these topics are introduced in class, student activities are designed to focus on particular aspects in their environment. When students carry out sustained observations after learning about a topic, like pollination, their focus is limited to observations of pollination as an event. Consequently, their questions and learning experience are driven and limited by the teacher's imagination.

In contrast, choosing to selectively structure my online sessions based on student responses left room for students to make spontaneous observations and experience a sense of discovery.

Bringing in structure at specific points allowed for focused and systematic observation and deeper explorations – both of which are crucial in building awareness of the surrounding environment. This became apparent in the third and fourth sessions when there

was a shift in the nature of students' observations. Going back several times to a location allowed them to sense changes in relationships, patterns, and rhythms. For instance, sustained observation of plants allowed students to become curious about relationships between insects and flowers, and patterns of insect movement between flowers at different times of the day. Understanding of pollination as one of the many relationships between plants and insects emerged from this curiosity and the inquiry that followed. Students raised questions like: *"Why do insects come to flowers? Why do they move from one flower to another on the same plant? Some insects keep going back and forth from a flower on one plant to a flower of another plant? Is it for food?"* These questions led to a discussion on pollination and climate change. Since students arrived at these concepts through their own experience

rather than a textbook definition, this approach allowed for a more active and richer learning experience.

This made me wonder about the differences in the two learning experiences. A selectively structured session allows students to use their imagination and creativity to learn by observing, recording, reflecting, questioning, and inferring from their own observations. Learning from their own experience deepens and enriches students' understanding of concepts when they meet it in textbooks and other resources. It allows them to see relationships and connectedness in natural phenomena rather than perceive them as discrete, isolated topics in a textbook. This experience has led me to believe that structure and spontaneity can coexist for meaningful learning. Also, an educator can help create an immersive learning experience by acting as a facilitator.

Key takeaways

- Immersive learning experiences allow for spontaneity in learning, evoking wonder and curiosity.
- Structured learning experiences directed to specific topics and explorations can limit student imagination and learning.
- Open-ended sessions, selectively structured, bring focus and depth, building awareness and sensitivity to change.
- Minimal instructions, like those regarding ways to record, reflect upon, and draw inferences from observations, can enrich students' understanding of scientific ideas.
- Learning by observing and questioning allows students to weave together related scientific concepts experientially.
- Structure and spontaneity can coexist for meaningful learning. An educator acting as a facilitator can help create an immersive learning experience.



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